1. The elements on the Periodic Table are arranged in order of increasing

Ⓐ atomic mass Ⓑ atomic number
Ⓒ molar mass Ⓓ oxidation number

2. Which list includes elements with the most similar chemical properties?

Ⓐ Br, Ga, Hg Ⓑ Cr, Pb, Xe
Ⓒ O, S, Se Ⓓ N, O, F

3. The elements in Group 2 are classified as

Ⓐ metals Ⓑ metalloids
Ⓒ nonmetals Ⓓ noble gases

4. Which element has chemical properties that are most similar to the chemical properties of sodium?

Ⓐ beryllium Ⓑ calcium
Ⓒ lithium Ⓓ magnesium

5. Which list of elements contains a metal, a metalloid, a nonmetal, and a noble gas?

Ⓐ Be, Si, Cl, Kr Ⓑ C, N, Ne, Ar
Ⓒ K, Fe, B, F Ⓓ Na, Zn, As, Sb

6. The chemical properties of calcium are most similar to the chemical properties of

Ⓐ Ar Ⓑ K Ⓒ Mg Ⓓ Sc

7. Which statement identifies the element arsenic?

Ⓐ Arsenic has an atomic number of 33.
Ⓑ Arsenic has a melting point of 84 K.
Ⓒ An atom of arsenic in the ground state has eight valence electrons.
Ⓓ An atom of arsenic in the ground state has a radius of 146 pm.

8. Which statement explains why sulfur is classified as a Group 16 element?

Ⓐ A sulfur atom has 6 valence electrons.
Ⓑ A sulfur atom has 16 neutrons.
Ⓒ Sulfur is a yellow solid at STP.
Ⓓ Sulfur reacts with most metals.

9. Which list consists of elements that have the most similar chemical properties?

Ⓐ Mg, Al, and Si Ⓑ Mg, Ca, and Ba
Ⓒ K, Al, and Ni Ⓓ K, Ca, and Ga

10. Which element is an alkali metal?

Ⓐ hydrogen Ⓑ calcium
Ⓒ sodium Ⓓ zinc

11. Base your answer to the following question on the information below.

Given: Samples of Na, Ar, As, Rb

Which *two* of the given elements have the most similar chemical properties?

12. Most of the groups in the Periodic Table of the Elements contain

Ⓐ nonmetals, only
Ⓑ metals, only
Ⓒ nonmetals and metals
Ⓓ metals and metalloids

13. The properties of carbon are expected to be most similar to those of

Ⓐ boron
Ⓑ aluminum
Ⓒ silicon
Ⓓ phosphorus

14. In which set do the elements exhibit the most similar chemical properties?

Ⓐ N, O, and F
Ⓑ Hg, Br, and Rn
Ⓒ Li, Na and K
Ⓓ Al, Si and P

15. As the elements in Group 15 are considered in order of increasing atomic number, which sequence in properties occurs?

Ⓐ nonmetal → metalloid → metal
Ⓑ metalloid → metal → nonmetal
Ⓒ metal → metalloid → nonmetal
Ⓓ metal → nonmetal → metalloid

16. All of the atoms of the elements in Period 2 have the same number of

Ⓐ protons
Ⓑ neutrons
Ⓒ valence electrons
Ⓓ occupied energy levels (shells)

17. Which group contains both metals and nonmetals?

Ⓐ 1 Ⓑ 3 Ⓒ 15 Ⓓ 7

18. Which element is in Group 2 and Period 7 of the Periodic Table?

Ⓐ magnesium
Ⓑ manganese
Ⓒ radium
Ⓓ radon

19. On the Periodic Table, an element classified as a semimetal (metalloid) can be found in

Ⓐ Period 6, Group 15
Ⓑ Period 2, Group 14
Ⓒ Period 3, Group 16
Ⓓ Period 4, Group 15

20. Which group is known as the halogens?

Ⓐ 1 Ⓑ 2 Ⓒ 17 Ⓓ 18

21. Which represents the electron configuration of a metalloid in the ground state?

Ⓐ 2-3 Ⓑ 2-5 Ⓒ 2-8-5 Ⓓ 2-8-6

22. Which sequence of atomic numbers represents elements which have similar chemical properties?

Ⓐ 19, 23, 30, 36
Ⓑ 9, 16, 33, 50
Ⓒ 3, 12, 21, 40
Ⓓ 4, 20, 38, 88

23. Alkali metals, alkaline earth metals, and halogens are elements found respectively in Groups

Ⓐ 1, 2, and 18
Ⓑ 2, 13, and 17
Ⓒ 1, 2, and 14
Ⓓ 1, 2, and 17

24. Which elements are malleable and good conductors of electricity?

Ⓐ iodine and silver Ⓑ iodine and xenon
Ⓒ tin and silver Ⓓ tin and xenon

25. Which statement describes a chemical property of iron?

Ⓐ Iron can be flattened into sheets.
Ⓑ Iron conducts electricity and heat.
Ⓒ Iron combines with oxygen to form rust.
Ⓓ Iron can be drawn into a wire.

26. At STP, which element is solid, brittle, and a poor conductor of electricity?

Ⓐ Al Ⓑ K Ⓒ Ne Ⓓ S

27. What are two properties of most nonmetals?

Ⓐ high ionization energy and poor electrical conductivity
Ⓑ high ionization energy and good electrical conductivity
Ⓒ low ionization energy and poor electrical conductivity
Ⓓ low ionization energy and good electrical conductivity

28. Which element is a liquid at STP and has low electrical conductivity?

Ⓐ silver Ⓑ mercury
Ⓒ barium Ⓓ bromine

29. Which characteristics describe most nonmetals in the solid phase?

Ⓐ They are malleable and have metallic luster.
Ⓑ They are malleable and lack metallic luster.
Ⓒ They are brittle and have metallic luster.
Ⓓ They are brittle and lack metallic luster.

30. Which element is a noble gas?

Ⓐ krypton Ⓑ chlorine
Ⓒ antimony Ⓓ manganese

31. Which list of elements consists of metalloids, only?

Ⓐ B, Al, Ga Ⓑ C, N, P
Ⓒ O, S, Se Ⓓ Si, Ge, As

32. The valence electrons of a germanium atom in the ground state are located in the

Ⓐ first shell Ⓑ second shell
Ⓒ third shell Ⓓ fourth shell

33. Which element has an atom in the ground state with a total of three valence electrons?

Ⓐ aluminum Ⓑ lithium
Ⓒ phosphorus Ⓓ scandium

34. As the elements is Period 3 are considered in order of increasing atomic number, there is a general *decrease* in

Ⓐ atomic mass
Ⓑ atomic radius
Ⓒ electronegativity
Ⓓ first ionization energy

35. An atom of which element has the largest atomic radius?

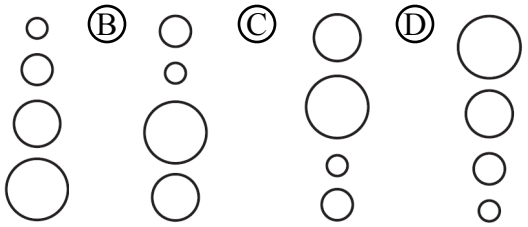
Ⓐ Fe Ⓑ Mg Ⓒ Si Ⓓ Zn

36. As atomic number increases within Group 15 on the Periodic Table, atomic radius

Ⓐ decreases, only
Ⓑ increases, only
Ⓒ decreases, then increases
Ⓓ increases, then decreases

37. Which grouping of circles, when considered in order from the top to the bottom, best represents the relative size of the atoms of Li, Na, K, and Rb, respectively?

Ⓐ Ⓑ Ⓒ Ⓓ



38. Which trends are observed when the elements in Period 3 on the Periodic Table are considered in order of increasing atomic number?

Ⓐ The atomic radius decreases, and the first ionization energy generally increases.
Ⓑ The atomic radius decreases, and the first ionization energy generally decreases.
Ⓒ The atomic radius increases, and the first ionization energy generally increases.
Ⓓ The atomic radius increases, and the first ionization energy generally decreases.

39. Which of the following electron configurations represents the element with the smallest atomic radius?

Ⓐ 2-4 Ⓑ 2-5 Ⓒ 2-6 Ⓓ 2-7

40. Which sequence of elements is arranged in order of decreasing atomic radii?

Ⓐ Al, Si, P Ⓑ Li, Na, K
Ⓒ Cl, Br, I Ⓓ N, C, B

41. Which atom in the ground state requires the *least amount of energy to remove its valence electron?*

Ⓐ lithium atom Ⓑ potassium atom
Ⓒ rubidium atom Ⓓ sodium atom

42. Which general trend is found in Period 2 on the Periodic Table as the elements are considered in order of increasing atomic number?

Ⓐ decreasing atomic mass
Ⓑ decreasing electronegativity
Ⓒ increasing atomic radius
Ⓓ increasing first ionization energy

43. From which of these atoms in the ground state can a valence electron be removed using the *least* amount of energy?

Ⓐ nitrogen Ⓑ carbon
Ⓒ oxygen Ⓓ chlorine

44. Which sequence correctly places the elements in order of increasing ionization energy?

Ⓐ $H \rightarrow Li \rightarrow Na \rightarrow K$
Ⓑ $I \rightarrow Br \rightarrow Cl \rightarrow F$
Ⓒ $O \rightarrow S \rightarrow Se \rightarrow Te$
Ⓓ $H \rightarrow Be \rightarrow Al \rightarrow Ga$

45. Which electron configuration represents an element with the highest first ionization energy?

Ⓐ 2-1 Ⓑ 2-2 Ⓒ 2-8-1 Ⓓ 2-8-2

Base your answers to questions **46** through **48** on the elements in Group 2 on the Periodic Table.

46. Explain, in terms of atomic structure, why the elements in Group 2 have similar chemical properties.

47. State, in terms of the number of electron shells, why the radius of a strontium atom in the ground state is larger than the radius of a magnesium atom in the ground state.

48. State the general trend in first ionization energy for the elements in Group 2 as these elements are considered in order from top to bottom in the group.

49. Base your answer to the following question on the information below.

Elements with atomic numbers 112 and 114 have been produced and their IUPAC names are pending approval. However, an element that would be put between these two elements on the Periodic Table has not yet been produced. If produced, this element will be identified by the symbol Uut until an IUPAC name is approved.

Identify one element that would be chemically similar to Uut.

50. Explain, in terms of electron configuration, why selenium and sulfur have similar chemical properties.

51. Explain, in terms of atomic structure, why the atomic radius of iodine is greater than the atomic radius of fluorine.

Base your answers to questions **52** and **53** on the table below.

First Ionization Energy of Selected Elements

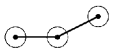
Element	Atomic Number	First Ionization Energy (kJ/mol)
lithium	3	520
sodium	11	496
potassium	19	419
rubidium	37	403
cesium	55	376

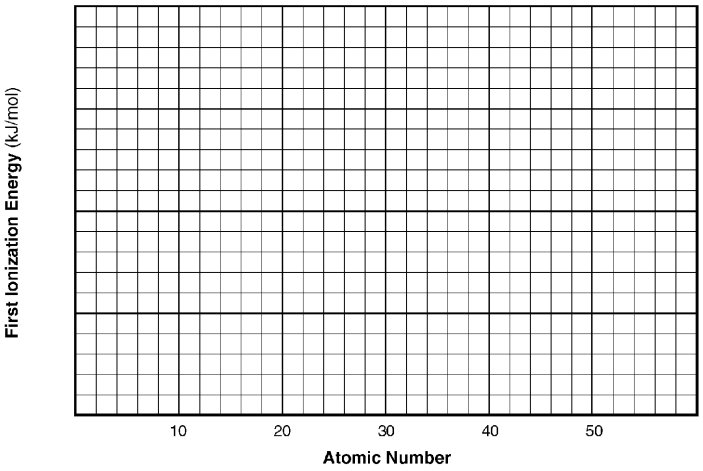
52. Explain, in terms of atomic structure, why cesium has a *lower* first ionization energy than rubidium.

53. State the trend in first ionization energy for the elements in the table as the atomic number increases.

54. Base your answer to the following question on the *Reference Tables for Physical Setting/Chemistry.*

Atomic Number	Element	First Ionization Energy (kJ/mol)
2	He	
10	Ne	
18	Ar	
36	Kr	
54	Xe	

Example: 



a Complete the data table provided for the following Group 18 elements: He, Ne, Ar, Kr, Xe

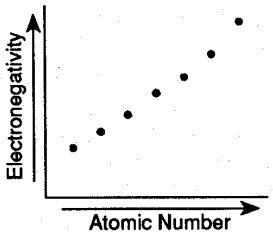
b Using information from your data table in part *a*, construct a line graph on the grid provided, following the directions below.

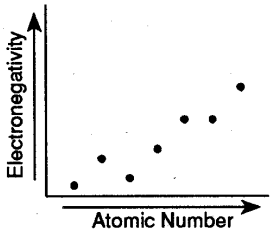
• Mark an appropriate scale on the axis labeled "First Ionization Energy (kJ/mol). "

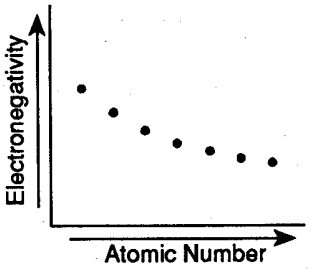
• Plot the data from your data table. Circle each point and connect the points.

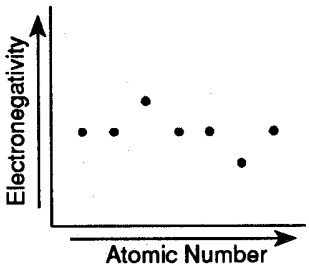
c Based on your graph in part *c*, describe the trend in first ionization energy of Group 18 elements as the atomic number increases.

55. Which diagram correctly shows the relationship between electronegativity and atomic number for the elements of Period 3?

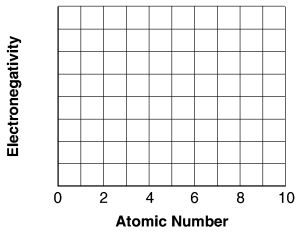
Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

56. The table below shows the electronegativity of selected elements of the Periodic Table.



Element	Atomic Number	Electronegativity (g/mL)
Beryllium	4	1.6
Boron	5	2.0
Carbon	6	2.6
Fluorine	9	4.0
Lithium	3	1.0
Oxygen	8	3.4

a On the grid set up a scale for electronegativity on the y-axis. Plot the data by drawing a best-fit line.

b Using the graph, predict the electronegativity of nitrogen. _____

c For these elements, state the trend in electronegativity in terms of atomic number.

57. The Group 17 element with the highest electronegativity is

Ⓐ fluorine Ⓑ chlorine
Ⓒ bromine Ⓓ iodine

58. As the elements Li to F in Period 2 of the Periodic Table are considered in succession, how do the relative electronegativity and the covalent radius of each successive element compare?

Ⓐ The relative electronegativity decreases, and the atomic radius decreases.
Ⓑ The relative electronegativity decreases, and the atomic radius increases.
Ⓒ The relative electronegativity increases, and the atomic radius decreases.
Ⓓ The relative electronegativity increases, and the atomic radius increases.

59. Properties of nonmetal atoms include

Ⓐ low ionization energy and low electronegativity
Ⓑ low ionization energy and high electronegativity
Ⓒ high ionization energy and low electronegativity
Ⓓ high ionization energy and high electronegativity

60. Electronegativity is a measure of an atom's ability to

Ⓐ attract the electrons in the bond between the atom and another atom
Ⓑ repel the electrons in the bond between the atom and another atom
Ⓒ attract the protons of another atom
Ⓓ repel the protons of another atom